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IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicant(s): Wieslaw JEDYNSKI et al.  
Int'l Application No.: PCT/EP2004/008204  
Application No.: **NEW APPLICATION**  
Filed: January 24, 2006  
For: **PLUG-IN CONNECTION SYSTEM WITH AN  
INTEGRATED LOCK**

**LETTER**

Customer Service Window  
Randolph Building  
401 Dulany Street  
Alexandria, VA 22314  
**Mail Stop PCT**

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Sir:

Amended claims are attached hereto (which correspond to Article 34 amendments or to claims attached to the International Preliminary Examination Report), as required by 35 U.S.C. § 371(c)(3). The Article 34 amended claims are incorporated in the included substitute specification and Preliminary Amendment.

Respectfully submitted,

HARNESS, DICKEY & PIERCE, P.L.C.

By: \_\_\_\_\_

Donald J. Daley, Reg. No. 34,313

P.O. Box 8910  
Reston, Virginia 20195  
(703) 668-8000

DJD:dpg

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In order to break the connection between the connector and the socket, the screws have to be unscrewed from the threads again. This plug-in connection system therefore has the disadvantage that, in order to make and release the plug-in connection, a great deal of manipulation is needed and a large amount of space is also required both for the purpose of accommodating the screw connection and for operating the latter.

In a further plug-in connection system with a locking apparatus according to the prior art, rocker arms are arranged on the connector, engage on the socket in the locked position and thus produce a mechanical coupling between the connector and the socket. In this case, the rocker arms on the connector are resiliently mounted under prestress, so that, in the locked position, they snap into corresponding projections on, or recesses in, the socket.

In order to break the connection between the connector and the socket, it is necessary, in this plug-in connection system, to individually and manually move the rocker arms into an unlocked position in which they disengage from the projections on, or recesses in, the socket in order to allow the connector to be disconnected from the socket. This plug-in connection system therefore likewise has the disadvantage that is it relatively complicated to release the plug-in connection and a great deal of space is required to arrange the rocker arms on the connector and to operate them.

US 5,328,288 discloses a known plug-in connection apparatus, which can be plugged onto a mating plug-in connection apparatus for electrical connection purposes in electrical modules. The plug-in connection apparatus described in that document comprises a housing and a locking device which is connected to the housing and is designed to mechanically couple the plug-in

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connection apparatus to the mating plug-in connection  
apparatus. The locking

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device can be moved between a locked position and an unlocked position here. Furthermore, the locking device is integrally connected to the housing.

US 5,312,268 also discloses a multi-electrode plug-in connection apparatus. This plug-in connection apparatus also comprises a locking apparatus which is integrally connected to a housing, it being possible to move the locking apparatus for locking and unlocking purposes and for mechanically coupling the plug-in connection apparatus to the mating plug-in connection apparatus.

Corresponding plug-in connection apparatuses are also disclosed in EP 0 549 370 A2, EP 1 020 959 A2 and US 6,102,727.

The object of the present invention is therefore to provide a plug-in connection apparatus and a plug-in connection system for electrical modules at the lowest cost possible, said apparatus/system being distinguished by ease of handling and a low space requirement, and ensuring reliable electrical connection of the modules. Furthermore, a corresponding method for releasing the plug-in connection system will also be specified.

According to the invention, the object is achieved by a plug-in connection apparatus which can be plugged into/onto a mating plug-in connection apparatus in order to electrically connect electrical modules, said apparatus having a housing and at least one locking device which is connected to the housing and serves to mechanically couple the plug-in connection apparatus to the mating plug-in connection apparatus, it being possible to move the locking device between a locked position and an unlocked position, with the locking device being integrally connected to the housing and the locking device having an unlocking element which, in the unlocked position, engages in a

mating element which is arranged on the housing and complements the unlocking element, so that the locking device can be fixed in the unlocked position.

The advantages of this integral design of the locking device and housing are simplified production of the entire system and simplified logistics when handling the parts for the connection system which are to be fitted. Outlay on installation is also reduced.

The invention further provides a method for disconnecting a plug-in connection apparatus of the above type from the mating plug-in connection apparatus by fixing the at least one locking device in the unlocked position by means of the unlocking device, and releasing the plug-in connection apparatus from the mating plug-in connection apparatus.

In one preferred embodiment of the plug-in connection apparatus according to the invention, the locking device has at least one unlocking hook or a corresponding unlocking element. In an unlocked position, said hook/element can engage in a barb or mating element which is arranged on the housing of the plug-in connection apparatus and complements the unlocking hook. The unlocking hook is preferably located at the free end of the locking hook, but it may also

New patent claims 1 to 12

1. A plug-in connection apparatus which can be plugged into/onto a mating plug-in connection apparatus in order to electrically connect electrical modules, having

- a housing (16) and
- at least one locking device (17) which is connected to the housing (16) and serves to mechanically couple the plug-in connection apparatus to the mating plug-in connection apparatus,
- it being possible to move the locking device (17) between a locked position and an unlocked position, and
- the locking device (17) being integrally connected to the housing,

characterized in that

- the locking device (17) has an unlocking element (19) which, in the unlocked position, engages in a mating element (21) which is arranged on the housing (16) and complements the unlocking element (19), so that the locking device (17) can be fixed in the unlocked position.

2. The plug-in connection apparatus as claimed in claim 1, with the locking device (17) having a locking hook or a locking eye for the purpose of mechanical coupling to the mating plug-in connection apparatus.

3. The plug-in connection apparatus as claimed in either of the preceding claims, with the locking device (17) having an end (22) which is rigidly connected to the housing (16), as a result of which the locking device (17) is resiliently mounted on the housing (16).

4. The plug-in connection apparatus as claimed in one of the preceding claims, with the unlocking element (19) comprising an unlocking hook or an unlocking eye.

5. The plug-in connection apparatus as claimed in one of the preceding claims, with the unlocking element (19) and the mating element (21) engaging in such a way that the unlocking element (19) automatically disengages from the mating element (21) when the plug-in connection apparatus is inserted into the mating plug-in connection apparatus.

6. The plug-in connection apparatus as claimed in one of the preceding claims, with the locking device (17) being resiliently mounted on the housing (16) in such a way that it is prestressed toward the locked position, so that the locking device (17) automatically snaps into the locked position when the plug-in connection apparatus is inserted into the mating plug-in connection apparatus.

7. The plug-in connection apparatus as claimed in one of claims 2 to 6, with the free end of the locking hook (17) having an edge (20) which is inclined essentially in the direction of the insertion movement (A) of the plug-in connection apparatus into the mating plug-in connection apparatus.

8. The plug-in connection apparatus as claimed in claim 7, with the edge (20) directly adjoining a projection (18) of the locking hook (17), which projection engages on the connector in the locked position.

9. The plug-in connection apparatus as claimed in one of the preceding claims, with a respective locking device (17) being provided on two opposite sides of the housing (16).

10. A plug-in connection system having a plug-in connection apparatus as claimed in one of the preceding claims, which apparatus is in the form of a socket, and a mating plug-in connection apparatus which corresponds to a connector.

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11. The plug-in connection system with a plug-in connection apparatus as claimed in one of claims 1 to 9, which apparatus is in the form



of a connector, and with a mating plug-in connection apparatus which corresponds to a socket.

12. A method for disconnecting a plug-in connection apparatus as claimed in one of claims 1 to 8 from the mating plug-in connection apparatus by

- fixing the at least one locking device (17) in the unlocked position by means of the unlocking device, and
- releasing the plug-in connection apparatus from the mating plug-in connection apparatus.